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KEY POINTS

- Air pollution reaches hazardous levels in Bishkek during wintertime, causing large adverse health and economic impacts.
- The drivers of air pollution are now clear: residential coal heating is the primary cause, followed by diesel vehicles.
- This Brief summarizes the consensus around air pollution and its causes in Bishkek and proposes practical interventions to resolve this issue.

Tackling Air Pollution in Bishkek: A Road Map to Cleaner Air

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Air pollution is a mixture of substances suspended in the air that are harmful to humans. It largely arises from combustion of biomass and fossil fuels. A growing body of evidence indicates that air pollution is responsible for adverse health effects, impacting various organs and systems within the human body. Of particular concern are particles of less than 10 microns in diameter (PM_{10}), and fine particles of less than 2.5 microns in diameter ($PM_{2.5}$). Both penetrate deep into the lungs, causing respiratory diseases and cancers, and affecting other organs. $PM_{2.5}$ can even enter the bloodstream, increasing the risks of cardiovascular diseases. Other air pollutants include nitrogen oxides (NO_x) and sulfur dioxide (SO_2).

In Bishkek, the capital of the Kyrgyz Republic, air pollution exceeds WHO air quality guidelines by up to 30 times in winter. Annual mean $PM_{2.5}$ concentrations are around 30 micrograms per cubic meter ($\mu g/m^3$) in Bishkek, and they rise to 80 $\mu g/m^3$ on average in winter, and even up to 150 $\mu g/m^3$ in one area north of

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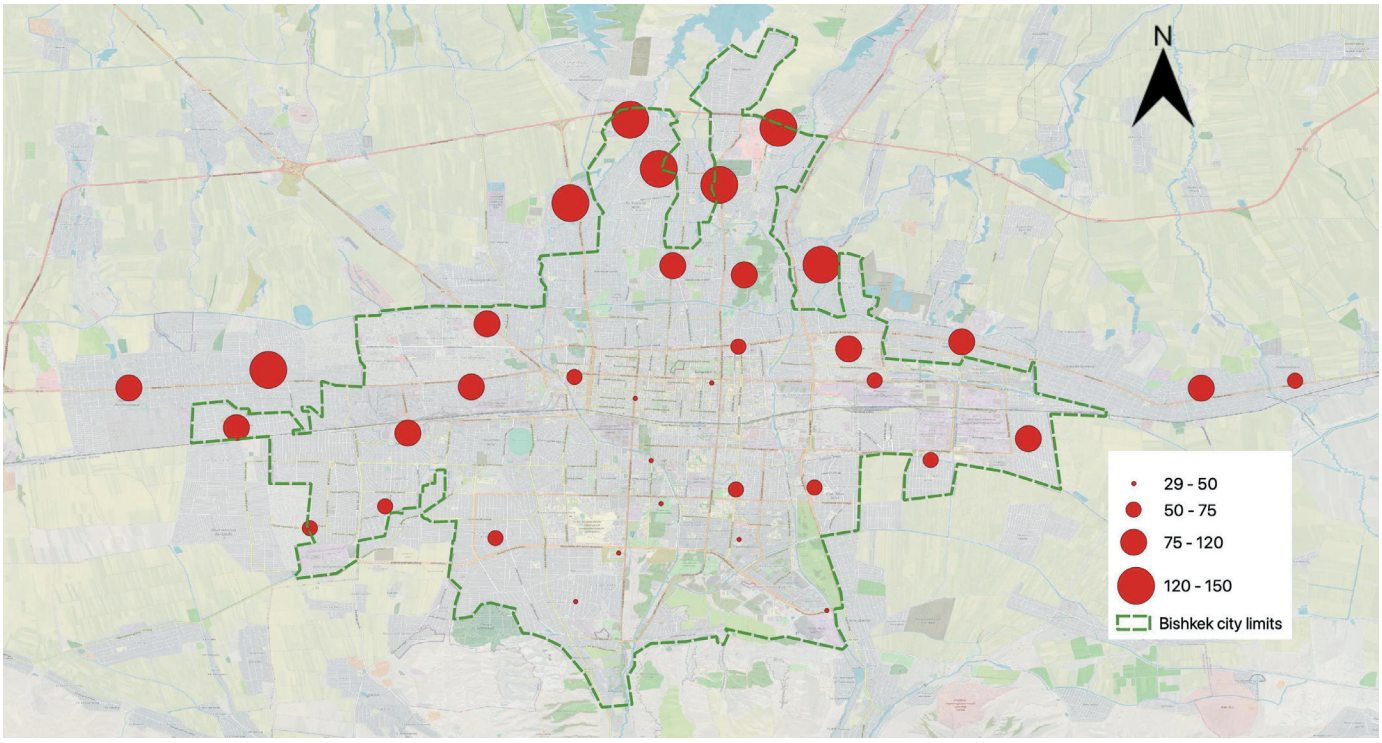
Figure 1: Average $PM_{2.5}$ Concentration in Bishkek, November 2021–January 2022

$PM_{2.5}$ concentration in winter reaches 80 μg/m³ on average in Bishkek.



$PM_{2.5}$ = particulate matter of less than 2.5 microns in diameter, μg/m³ = microgram per cubic meter.

Sources: OpenStreetMap, and authors' computations using data from air quality sensors deployed by KyrgyzHydromet with support from the Asian Development Bank.

the city (Figure 1).[1] In contrast, the WHO recommends limiting annual mean exposure to 5 μg/m³.[2] Data is lacking for other cities in the country, but geoclimatic conditions and reliance on coal for heating suggest these cities also face unsafe pollution levels.

Air pollution generates more than $20 million in annual economic losses from premature death and ill-health in Bishkek, plus losses from non-health effects. In the country as a whole, air pollution causes more deaths and ill-health than all other environmental risk factors combined.[3] These impacts concentrate on the older people and children in the first days of life as air pollution raises risks of premature birth. The resulting burden falls disproportionately on women as they are most often responsible for care taking. In Bishkek, UNICEF estimated that $PM_{2.5}$ caused around 112 deaths over 12 months from July 2021 to June 2022.[4] The UNICEF report also estimated that $PM_{2.5}$ pollution caused the loss of about 3,568 disability-adjusted life years over this 1-year period, translating in an economic loss of $20.8 million. Besides health impacts, air pollution also limits the attractiveness of Bishkek for tourists and investors; and NO_x and SO_2 emissions generate acid particles and droplets which cause vehicles, buildings, and infrastructure to age prematurely.[5]

1 The annual average is from: UNDP and UNEP. 2022. *Air Quality in Bishkek: Assessment of Emission Sources and Road Map for Supporting Air Quality Management*. Bishkek and Nairobi. Winter exposure is the simple average in November 2021–January 2022, across 36 sensors deployed by KyrgyzHydromet with ADB support.

2 WHO. 2021. *WHO Global Air Quality Guidelines*. Geneva.

3 Air pollution causes 1.6 times more deaths and 1.9 more losses of disability-adjusted life years than non-optimal temperatures, unsafe water, and other environmental risks combined. See Institute for Health Metrics and Evaluation. 2020. *Global Burden of Disease Study 2019 Results*. Seattle.

4 The methodology and resulting estimates were confirmed by expert review of the WHO, as requested by the Ministry of Health of the Kyrgyz Republic. See UNICEF. 2023. *Health and Social Impacts of Air Pollution on Women and Children in Bishkek, Kyrgyzstan*. Bishkek.

5 C. Eusébio et al. 2021. The Impact of Air Quality on Tourism: A Systematic Literature Review. *Journal of Tourism Futures* 7(1).

Data on air pollution in Bishkek is widely available. Air quality monitoring is essential for assessing air pollution and the effectiveness of measures to address it. There are two reference monitoring stations in the city: one managed by the government's agency for hydrometeorology (KyrgyzHydromet) and another in the embassy of the United States (US). In addition, KyrgyzHydromet deployed 50 air pollution sensors in 2021, with support from ADB. And civil society organizations such as MoveGreen have also deployed sensors. These allow quantifying air pollution and mapping its distribution across space and time. This data, available in real-time, has also contributed to raising public awareness.

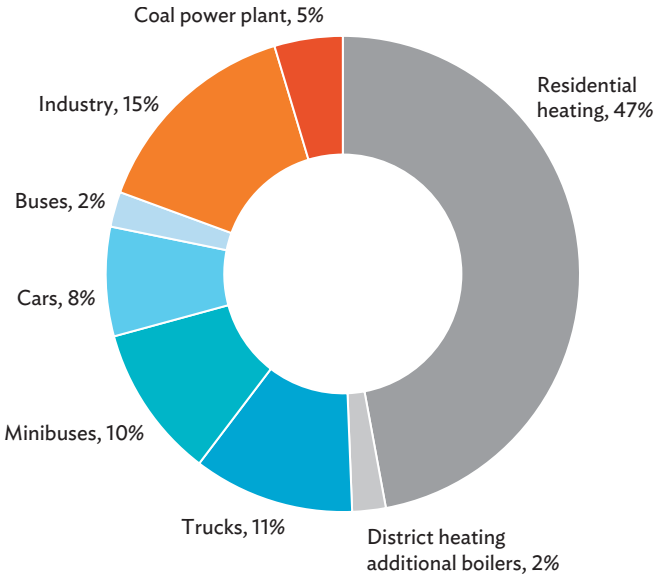
Several recent studies have identified the main sources of air pollution in Bishkek. A UNDP-UNEP assessment identified individual residential coal heating as the primary source of pollution, followed by road transport (footnote 1). A UNICEF report showed that $PM_{2.5}$ concentrations are the highest in the areas where households rely the most on coal for heating (footnote 4). The report also estimated health impacts and associated costs. Moreover, an IOM study relied on a survey and focus group discussions to explore the drivers of air pollution and its perception by residents in the most polluted neighborhoods, notably internal migrants.[6]

These analyses show that coal burning for heating is the leading cause of air pollution in winter. UNDP and UNEP estimated that residential heating generates about half of annual $PM_{2.5}$ emissions, and a much larger share in winter (Figure 2) (footnote 1). Transport is estimated to contribute around another third to annual emissions—particularly diesel trucks and minibuses. Other sources of emissions include industrial activity, the coal power plant, coal boilers for district heating, and solid waste burning. But emissions do not all affect air quality equally. Those dispersed at the edge of the city through high stacks—from the coal power plant, for example—affect ground-level concentrations less than the emissions released near the ground and across the city, for example from coal heating and diesel vehicles. To make things worse, an inversion layer often traps pollutants emitted near the ground during winter.

Now is the time to act. There is now a body of evidence to support investment and policy changes to address air pollution. Even as more detailed evidence is gathered and research is conducted, various "no-regret" measures can already be implemented that will provide benefits in any case. In Bishkek, this means tackling the main sources of air pollution that are already known. Addressing air pollution is even more urgent as the city's population is expected to rise by more than 20% in the coming decade. Without durable solutions, new constructions and additional traffic will further worsen air quality. To guide interventions, ADB has developed a Clean Air Action Plan suggesting priority actions.[7]

Figure 2: Estimated Emissions of $PM_{2.5}$ in Bishkek by Source, 2023

Residential heating is the main driver of fine particle pollution in Bishkek, followed by transport.



$PM_{2.5}$ = particulate matter of less than 2.5 microns in diameter.

Note: Emissions from solid waste burning are excluded from this inventory as they mostly arise outside the city limits.

Source: Authors' computations based on forecasts for 2023 from: UNDP and UNEP. 2022. *Air Quality in Bishkek: Assessment of Emission Sources and Road Map for Supporting Air Quality Management*. Bishkek and Nairobi.

Projects tackling air pollution can attract grants and climate financing. As all measures to address air pollution ultimately target combustion, these interventions would also reduce carbon dioxide (CO_2) emissions, in line with the global climate agenda and climate pledges by the Kyrgyz Republic. This can help attract concessional and grant financing from global climate funds such as the Global Environment Facility and the Climate Investment Funds. Projects tackling emissions can also be financed by selling carbon credits to foreign sovereign or private-sector buyers.

Development partners stand committed to improving air quality. An air quality working group has been established under the Development Partner Coordination Council, to ensure coordination among partners. This Brief underlines their actions and proposes interventions that can be implemented with support from international donors.

[6] IOM. 2022. *Air Pollution and Its Health Impacts on Internal Migrants in Bishkek, Kyrgyzstan*. Geneva.
[7] ADB. 2023. *Bishkek Clean Air Action Plan*. Manila.

REPLACING COAL BY CLEAN HEATING SOLUTIONS IS THE FIRST PRIORITY

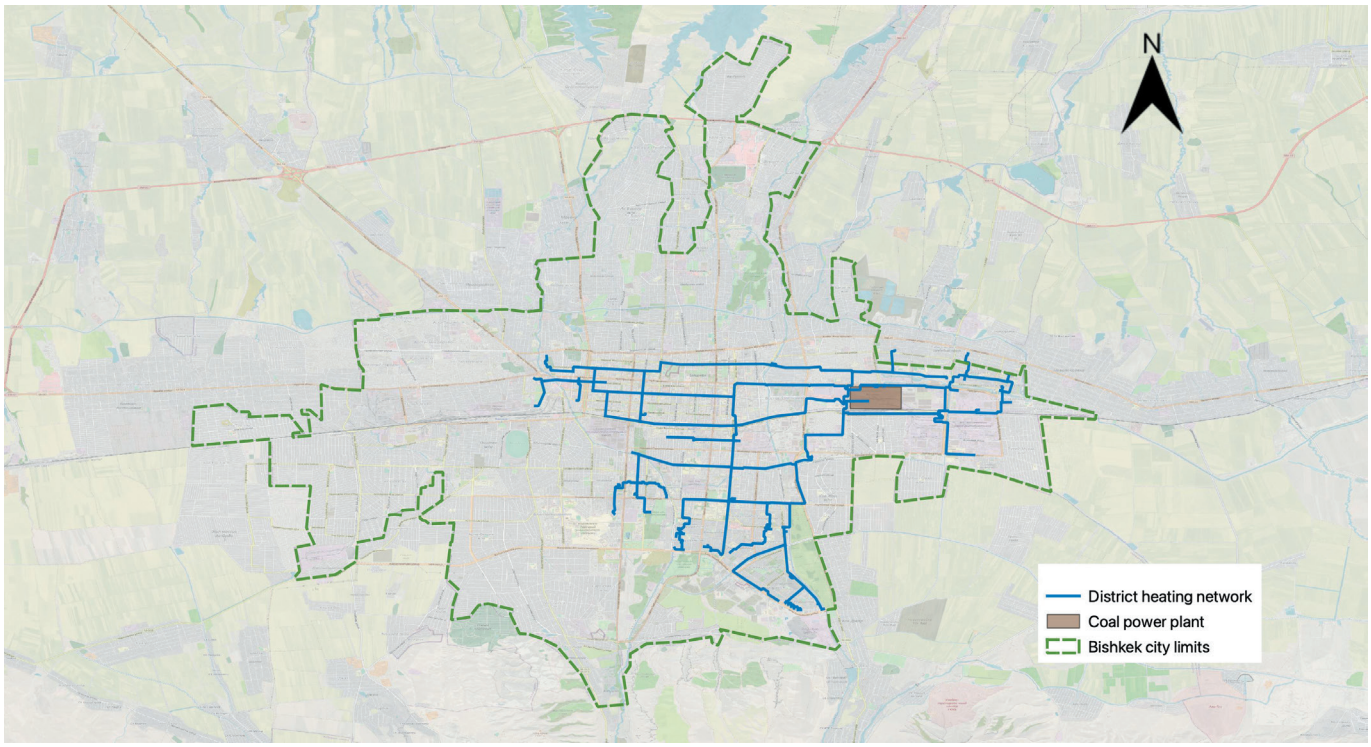
Measures should primarily address space heating, given the large contribution of this sector to air pollution. Interventions should be guided by a systematic evaluation of policies, weighing marginal health benefits against costs. Investing in cleaner coal or more efficient stoves would not be enough to achieve the objectives of urban air favorable for life and health. It would also lock in coal-based solutions, thus delaying the transition to clean energy. And while converting heating to gas would alleviate air pollution, it would still emit large amounts of greenhouse gases, heighten energy dependence issues, and cost more in the long term. Instead, air pollution can be reduced by lowering the need for heating through improved building energy efficiency and providing affordable access to clean heating solutions.

The district heating network should be expanded in densely-populated areas. The network serves the center and southeast of Bishkek, with heat mostly generated by the coal power plant, alongside electricity (Figure 3). The network was also supplemented by 22 coal boilers scattered across the city, but 18 were converted to gas in spring and summer 2023, and the remaining 4 to electricity. Replacing them by large heat pumps would cut dependence on imports as well as costs, in the long term. The World Bank is also investing $38 million in upgrading the existing heat distribution network.[8] Expanding the network, on the other hand, will require laying new pipes and generating more heat. To maximize efficiency while limiting emissions, this should be done with large heat pumps, leveraging waste heat whenever possible. Even without generating more heat, replacing pumps in the distribution network would allow serving more households. Lastly, stand-alone district heating networks could be developed in densely populated areas where distribution losses can easily be contained.

Heat pumps should replace coal-based heating in private houses. Heat pumps amplify heat extracted from the air, water, or the ground. This process is much more efficient than coal and gas boilers, and also electric heaters. While these technologies can at best generate 1 kilowatt-hour (kWh) of heat from 1 kWh of energy, the geothermal heat pumps already functioning in Bishkek generate 4.2 kWh of heat on average for each kWh

Figure 3: Main District Heating Network in Bishkek

The district heating network covers about a third of the city's area.



Sources: OpenStreetMap and BishkekTeploset. 2023. Serviced Area (in Russian).

[8] $38 million corresponds to component 1 of the World Bank's $48 million Heat Supply Improvement Project. See World Bank. 2023. *Heat Supply Improvement Project Additional Financing (P180748)*. Washington, DC.

of electricity.[9] As they are powered by electricity, heat pumps generate zero direct emissions. And as more than 90% of the country's electricity is from hydropower, they would also generate minimal indirect emissions.[10] Lastly, scaling up heat pumps should not increase electricity demand by much as households relying on coal often use electric heaters as well. Given that heat pumps are about four times more efficient, phasing out these heaters should largely offset the electricity consumption of heat pumps.

Geothermal heat pumps are more efficient, but air-source heat pumps may also be considered in the south of Bishkek. Given the cold climate, geothermal heat pumps (also known as ground-source heat pumps) are more efficient in winter as ground temperature remains constant through the year. In the south of the city, however, cold-climate air-to-air heat pumps could be considered instead as the rockier underground makes geothermal heat pumps more costly.

Improving building energy efficiency to lower the need for heating. This will require tightening and enforcing norms for new constructions, regarding heat insulation, air tightness, and ventilation. Existing buildings may also be retrofitted, with ceiling, floor, and wall insulation, and more efficient windows. To speed up the process in multi-owner buildings, the decision-making rule to engage in energy efficiency improvement can be softened. Regarding financing, the Kyrgyz Sustainable Energy Financing Facility (KyrSEFF)—a credit line from the European Bank for Reconstruction and Development (EBRD)—supports investment in residential household energy efficiency improvements and cleaner heating solutions. The credit line is implemented through local banks, with support from UNISON Group. IOM is also developing a project to promote climate-resilient housing plans, including energy-efficient technologies for prefabricated houses. The project will also pilot heat insulation retrofitting for vulnerable households. UNDP is also supporting enhancement of energy efficiency policies.[11]

Eliminating coal heating will require large investments. About 150,000 households in Bishkek rely on coal for heating.[12] Even assuming a cost of just $5,000 to replace coal by a clean alternative, phasing out coal altogether would still cost $750 million—about 7% of the country's gross domestic product. Lowering the final cost for households is thus critical to ensure that as many as possible can be equipped. Procuring heat pumps and thermal insulation in bulk can achieve price reductions but grant resources will also be needed.

Long-term savings should be channeled to upfront investment in clean heating. For households using electric heaters alongside coal, improved insulation and heat pumps will lower electricity consumption. This will generate gains for these households, but also for the state-owned Electric Stations company as electricity tariffs remain below cost recovery, despite the 30% increase in May 2023. These future savings can cover upfront investment to shift away from coal. For households, this can be achieved through loans, leasing contracts, or schemes where heat pump usage is charged on a pay-as-you-go system. An Energy Efficiency Fund could also be set up to invest in retrofitting buildings in exchange for future payments reflecting gradual savings, as it was done in Armenia.

Cleaner air and lower CO_2 emissions justify subsidizing by the government and international donors. Cleaner air will benefit everyone in Bishkek. This justifies subsidizing investment, particularly for the poorer households who could not abandon coal otherwise. This can take the form of tax exemptions, subsidized loans, or direct subsidies. Public authorities could also invest in ground loops under the streets, to which households could connect heat pumps for free. This could be combined with investment in paving roads. Phasing out coal heating will also lower CO_2 emissions, which will attract concessional and grant financing from development organizations. Lastly, reducing CO_2 emissions could be financed by selling carbon credits to investors wishing to offset their emissions.[13]

DEVELOPING SLOW MOBILITIES AND CLEAN PUBLIC TRANSPORT

Cleaning urban transport is also critical to reduce air pollution. UNDP and UNEP estimated that transport generates about a third of annual $PM_{2.5}$ emissions in Bishkek, and a much larger share outside the heating season (footnote 1). Transport also generates the bulk of NO_x emissions. In the long term, expanding road infrastructure increases personal vehicle ownership, which raises traffic, congestion, and air pollution.[14] Instead, interventions should focus on developing slow mobilities such as walking and cycling, as well as public transport, which requires much less energy and space than individual vehicles to transport people.

Supporting slow mobilities will take vehicles off the roads. Slow mobilities generate zero air pollution, they are generally free, and they are good for health—except when air quality is really poor. These mobilities can be supported by ensuring that sidewalks and pedestrian crossings are convenient and safe. Dedicated bike lanes along the major arteries of the city could also be generalized. This would increase travel speed while ensuring the safety of both cyclists and pedestrians. Bike parking space should also be included

9 GIZ. 2021. *Study on Geothermal Heat Pumps in Kyrgyzstan*. Unpublished.
10 ADB and Ministry of Energy of the Kyrgyz Republic. 2022. *Master Plan for Complex Development of the Energy Sector of the Kyrgyz Republic*. Bishkek and Manila.
11 UNDP. 2021. *Energy Efficient Modernization of Public Buildings: How Can We Do That?*
12 In 2018, 40% of people in Bishkek relied on coal for heating, which corresponds to about 135,000 households. Adding the 11% population growth since 2018 puts the number of households on coal around 150,000 in 2023.
13 McKinsey Sustainability. 2021. *A Blueprint for Scaling Voluntary Carbon Markets to Meet the Climate Challenge*.
14 G. Duranton and M. Turner. 2011. The Fundamental Law of Road Congestion: Evidence from US Cities. *American Economic Review* 101(6).

when renovating a street. In Amsterdam and Copenhagen, for example, similar policies have allowed the share of trips made by bike to rise to 30% in 2013, from 20% in the 1990s.[15]

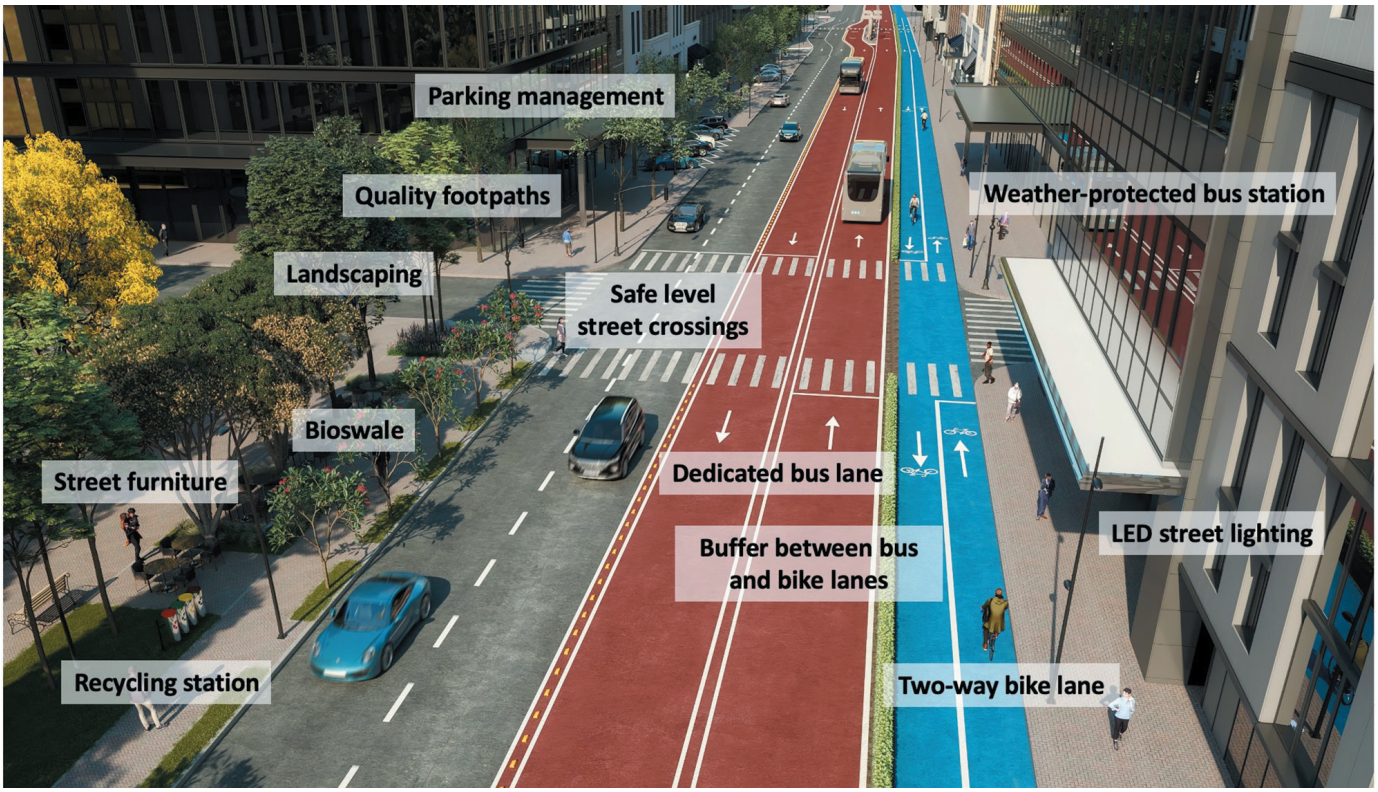
Developing public transport will alleviate air pollution and congestion. Besides limiting emissions, developing public transport in Bishkek will also reduce congestion, making transit faster for everyone. Public transport also allows people who do not own a car to seize work opportunities anywhere in the city, and it improves access to education, health, and leisure.[16] In expanding the public transport system, serving the outskirts of the city will be critical to mitigate spatial inequalities.

Diesel buses and minibuses should be replaced by cleaner models. Collective transport vehicles generate less emissions per passenger than individual cars. Still, the minibuses currently operated across Bishkek were estimated to generate about 10% of $PM_{2.5}$ emissions—about as much as private cars and twice as much as the coal power plant (footnote 1). For the routes with heavy traffic, larger buses are more efficient. The municipality has already procured 120 buses powered by natural gas. EBRD is providing €33 million (about $34.6 million) to finance another 140 buses also powered by natural gas—including an €8 million grant (about $8.4 million). And ADB is providing $51 million to finance 120 electric buses—including a $26 million grant. For routes with lower demand, minibuses will remain more efficient, but the old diesel models should be replaced by cleaner vehicles.

Dedicated bus lanes should be mainstreamed. Specific lanes are already dedicated to buses in certain portions of streets such as Moskovskaya, Abdrahmanova, and Tokombaeva. And the ADB-funded electric bus project will pilot a green mobility corridor on a stretch of Kyiv Street, in central Bishkek (Figure 4).

Figure 4: Pilot Green Mobility Corridor

A green mobility corridor will be piloted on Kyiv Street, in the center of Bishkek.



LED = light-emitting diode.
Note: The renovation may take a different form than in this illustration.
Source: Asian Development Bank. 2023. Unpublished.

[15] J. Pucher and R. Buehler. 2017. Cycling towards a More Sustainable Transport Future. *Transport Reviews* 37(6).
[16] J. Bastiaanssen, D. Johnson, and K. Lucas. 2020. Does Transport Help People to Gain Employment? A Systematic Review and Meta-analysis of the Empirical Evidence. *Transport Reviews* 40(5).

Two lanes will be dedicated to buses along this corridor, two bike lanes will be added, and parking spots will be rationalized and properly marked. Making similar adjustments along the main arteries of the city would increase bus transit speed and make travel time more predictable.

Bus routes and frequencies could also be optimized. In Abidjan and Istanbul, this has been done by mapping urban transit patterns using anonymized cell phone data.[17] Where dedicated bus lanes are not feasible, road traffic can also be optimized by synchronizing traffic lights, improving road marking and signalization, generalizing one-way streets, limiting left turns, and better enforcing traffic rules.[18]

With efficient public transport, paid parking could be generalized. This will incentivize shifting to alternatives.[19] Illegal parking should also be addressed to ensure that space allocated to traffic is used for this purpose, and to limit disruptions from car movements in and out of parking spots. Paid parking could be managed through a public–private partnership, generating revenue that can then be invested in public transport.

Car circulation could be restricted, particularly when air quality is the poorest. Driving could be restricted on certain days, depending on cars' license plates. Such restrictions could apply all weekdays—as in Bogota and Manila—or on peak pollution days only. And it could apply during the whole day, or during peak hours only. In Beijing, this helped reduce PM_{10} concentration by 21%.[20] Exemptions can be made for cars with more than two passengers to incentivize carpooling. Car-free days could also be organized on certain weekend days and public holidays to sensitize the public to the benefits of public transport and slow mobility.

Mandatory vehicle inspections should be re-established, including emission tests. UNDP and UNEP estimated that private cars generate about 10% of $PM_{2.5}$ emissions in Bishkek—almost entirely from diesel models—and half of NO_x emissions. Vehicle inspection can ensure that emission mitigation features such as catalytic converters are functional. Emission standards for key pollutants should also be set and tailpipe emissions tests carried out accordingly. To limit risks of corruption, this process may be automated and recorded, and it could be outsourced to the private sector along with appropriate incentives. Vehicle inspections would also allow detecting technical issues, thus improving road safety.

MAKING ELECTRICITY CLEANER AND MORE RELIABLE

The coal power plant could be converted to natural gas, but gains would be limited, and this would worsen energy dependence. UNDP and UNEP estimated that the coal power plant contributes a small fraction of Bishkek's $PM_{2.5}$ emissions. However, it contributes over half of the city's SO_2 emissions, and it is a major source of CO_2 emissions. Converting the plant to natural gas would drastically cut SO_2 emissions. But CO_2 emissions would remain high; and this would require securing long-term, reliable, and affordable gas supply, which is uncertain in the current geopolitical context.

Electric vehicles will require additional electricity supply. In 2022, electric cars already accounted for 21% of sales in the European Union (EU), and 29% in the People's Republic of China (PRC). In the Kyrgyz Republic, 4,085 electric cars were imported from the PRC in the first 8 months of 2023—six times more than in the same period in 2022. UNDP is supporting the development of charging stations in the country and the mobilization of the private sector for providing electricity-powered solutions for public transport. But the rise in electric vehicles will also increase electricity consumption. With home chargers delivering around 7 kilowatts, 1.8 million cars in the country in 10 years, and assuming that a third of cars will be electric and 20% charging during peak hours, this means that 840 megawatts (MW) of additional power will be needed.[21] This is about 20% of the current generation capacity, equivalent to 300 wind turbines, or half the expected capacity of the Kambarata-1 hydropower project (footnote 10).

Making electricity supply more reliable will provide confidence in clean heating alternatives. Without appropriate investment, rising demand for electricity will stress the grid even more, causing more frequent power outages. Improving reliability in winter is particularly important because it minimizes the use of fossil fuels to provide heat during outages; and it also makes the adoption of electricity-powered heat pumps more attractive.

UPGRADING SOLID WASTE MANAGEMENT

Solid waste burning contributes to air pollution. This has particularly affected the area near the landfill, north of Bishkek, where combustion has occurred from the methane arising from organic matter decomposition. This landfill fire was extinguished

[17] D. Talbot. 2013. African Bus Routes Redrawn Using Cell-Phone Data. *MIT Technology Review*; and J. Daly. 2013. How Cities Are Optimizing Public Transportation with Data from Mobile Devices. *StateTech*.

[18] J. Zhang et al. 2020. Study on the Influence of One-way Street Optimization Design on Traffic Operation System. *Measurement and Controls* 53 (7–8); and V. Gayah. 2021. Sick of Dangerous City Traffic? Remove Left Turns. *The Conversation*.

[19] H. Koster. 2022. Higher Parking Prices Reduce Traffic Congestion. *UrbanEconomics.nl*.

[20] V. Viard, V. Brian, and S. Fu. 2015. The Effect of Beijing's Driving Restrictions on Pollution and Economic Activity. *Journal of Public Economics*. 125.

[21] There are currently 1.1 million private cars in the country. Assuming that car ownership keeps rising by 5% annually (as in 2018–2022), the number of cars will rise to 1.8 million in 10 years. 7kW [average domestic charger power] * 33% [share of electric vehicles in total cars] * 1.8 million [total number of cars by 2033] * 20% [share of electric cars getting charged during peak hours] = 840 MW.

in May 2023, and a modern dumpsite is being built north of the current site, financed by EBRD and the EU. The new site should notably include a landfill gas ventilation system to avoid spontaneous combustion. But solid waste remains burnt in areas where household waste and organic material such as leaves are not appropriately collected.

Waste collection could be improved. To avoid solid waste burning, waste collection should first be expanded to all settlements in the outskirts of the city. Mandatory sorting and segregated collection should also be generalized to limit the volumes to be ultimately disposed of. Composting should also be encouraged, to minimize methane arising from the decomposition of organic matter when buried in landfills. Alternatively, organic matter could be collected to generate biogas. The EBRD–EU project includes a pilot to collect recyclables, which are currently mostly gathered by independent scavengers in hard and unhygienic conditions. Segregated waste collection and processing can be scaled up, and financed by monetizing waste such as metal, glass, plastic, and paper. A protocol was signed along these lines in March 2023 with two Czech companies that could invest $45 million in a waste processing plant.

EVALUATING INTERVENTIONS TO IMPROVE AIR QUALITY

Air quality monitoring is crucial for evaluating progress toward WHO air quality guidelines. This may require improving the multipollutant continuous ambient air monitoring network—an effort supported by the Finnish Meteorological Institute. Improving monitoring across the country also requires deploying more low-cost sensors, as currently done with support from ADB, Duke University, UNEP, and the US Department of State. And mobile air quality monitoring could help identify very localized pollution hotspots, for example along roads. Lastly, monitoring would benefit from additional air quality reference stations, which provide more precise data that can notably be used for calibrating low-cost sensors. And of course, air quality and meteorology data should be made public and easily available, to provide the basis for evidence-based policymaking.

Maintaining an emissions inventory and modeling emissions' impacts is necessary for assessing interventions to improve air quality. A robust emissions inventory is necessary for effective air quality management and planning, including in electricity generation, heating, transport, industry, and waste management. Modeling the impacts of interventions on air pollution can also support policy-making. This can be done using open access tools such as the ABODE software, which allows estimating health impacts of air pollution using relationships between exposure and health from the Global Burden of Disease study.

STRENGTHENING AIR QUALITY GOVERNANCE

Air quality standards need to be modernized to improve public awareness. The standards for official reporting on air quality in the Kyrgyz Republic do not reflect scientific findings from the last 3 decades, making them a poor reference to gauge health impacts. Aligning these standards with international norms would also allow for comparison with other countries and tracking of improvements relative to WHO guidelines. Adopting an official Air Quality Index—supported by reliable measurements—would also provide real-time information to the public. This could be combined with an early warning system providing recommendations to reduce exposure ahead of pollution peaks. This effort is currently led by the Government of the Kyrgyz Republic with support from UNEP and the US Department of State.

Governance regarding public awareness may also be strengthened. Public understanding of air quality drivers and impacts could be strengthened through direct citizen engagement, civil society organizations, and the media. This may encourage virtuous behaviors such as driving smoothly and not burning solid waste. Awareness raising should also target children through the education system as per the principles highlighted in the Declaration on Children, Youth and Climate Action, signed by the government in June 2023. To be effective, interventions in these respects would require well-defined governance mechanisms involving relevant public stakeholders.

A strong institutional framework is needed to guide air quality management. This framework requires institutional rearrangement, and improvement in the capacity and knowledge of the parties involved. It would also be useful to develop institutional mechanisms to incorporate air quality improvement features in project design in energy, transportation, and urban planning.

Regulations governing polluters need to be revised. A revision of the environmental permitting system, emission standards for stationary and non-stationary sources, and fuel quality standards is key to better monitor and regulate air pollution. Similarly, enhancing regulations around territorial planning would support cleaner air, for example, by supporting urban densification.

* * *

The top priorities to curb air pollution are clear: phasing out coal from residential heating, and developing slow mobilities and clean public transport. Further improving air quality will require regulating vehicle emissions, phasing out coal from the district heating system and the Bishkek power plant, and better managing solid waste. Efforts in these directions are already being made, but much remains to be done. Data collection and monitoring should be ensured along this process, to enable tracking of progress and evaluation. The international donor community stands ready to support the government, the Bishkek municipality, and the people of Bishkek in this transition to cleaner air.

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